

Gateway

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The ARRL Packet-Radio Newsletter

RF MODEMS DEBUT AT DAYTON

Two manufacturers recently announced the availability of 220-MHz RF modems. Advanced Electronics Applications and GLB both previewed their radios at the Dayton HamVention this year.

The AEA unit, designated the RFM-220, is a synthesized transceiver covering the entire 220-MHz band in 10-kHz steps, with programmable offset between the transmit and receive frequencies. The synthesizer can be remotely controlled. Data at rates up to 9600 bauds can be sent through the radio, as can voice signals. The transmitter output can be adjusted for from 1 to 30 watts. The receiver features a GaAs FET front end with multiple helical resonators. Price of the RFM-220 is in the \$600 range.

GLB's entry in the RF modem field, the NETLINK 220, operates at 19,200 bauds in a specified bandwidth of 30 kHz and is crystal controlled. It covers the 220-MHz band and features oven-controlled oscillators for stability, digital automatic frequency control (AFC), PIN-diode antenna switching and helical resonators in the receiver front end. The NETLINK 220 is priced at \$649.

Both units connect directly to a TNC for digital data communications.

These manufacturers can be contacted at:

GLB Electronics, Inc.	AEA
151 Commerce Pkwy.	P.O. Box C-2160
Buffalo, NY 14224	Lynnwood, WA 98036
716-675-6740	206-775-7373

PSK MODEMS ON METEOR SCATTER

The following discussion from Mike Spann, WB6KTN/ZR5KH, comments on the use of PSK for meteor scatter communications.

I read with interest Tom Clark's remarks on the use of PSK modems for meteor-scatter links [Gateway, Volume 3, Number 16]. What he says about PSK being the ideal choice for meteor scatter operations is true. As long as the Costas feedback loop filter [in the demodulator] is kept wide enough for fast locking time, the improved signal-to-noise-ratio performance and Doppler rejection of PSK is essential to low-power (less than 10-kW) operation.

There are two comments that I would like to make on Tom's suggestions. The first regards the choice of operating frequency. In meteor-scatter

communications, there is a tradeoff between signal strength/duration and interference. The duration of meteor bursts is proportional to $1/f^2$ and the received power is proportional to $1/f^3$, where f is the frequency being transmitted. This indicates that the lower the frequency the better. On the other hand, the lower frequencies suffer from higher levels of both natural and man-made noise as well as being "plagued" by other forms of beyond-the-horizon propagation. Because of its popularity for other, more normal forms of propagation, I don't see the 10-meter band being all that viable for meteor scatter. The 6-meter band is a very popular band for meteor-scatter work. Like most experimenters in meteor scatter, we are having good success in that band. The 4-meter band, on the other hand, looks like an even better alternative in terms of the tradeoff between noise and losses where that band is available.

My second comment is with regard to data rate. The waiting time between usable meteor trails will be minimized at about 4000 bit/s with a 500-watt transmitter on the 6-meter band. This requires using short (8-character) blocks and short form (1 byte) addressing. [AX.25 packets would not conform to this specification--Ed.] To try to operate at 1200 bit/s would change the waiting time from tens of seconds to tens of minutes between usable trails and would require reducing the block size even further. As an aside, it has been shown that throughput can be increased at the expense of waiting time by increasing the data rate. The limit imposed by intersymbol interference is about 200 kbit/s.

Just how to get permission for a 5- to 10-kbit/s PSK modem on either the 4- or 6-meter band is a problem that will have to be addressed before amateur meteor scatter will be viable as a reliable packet radio mode. [This is not a problem for US 6-meter operation.--Ed.] After that, you need only figure out how to deal with your neighbors when you pump out 1.5 kW in a 20-kHz bandwidth just a few megahertz from their favorite TV station!

By Mike Spann, WB6KTN/ZR5KH

JAMSAT ANNOUNCES NEW FO-12 DIGITAL MODE

On May 4, new software in the FO-12 satellite was put into operation.

The new mode allows "on demand" operation of Mode JD, which means that the bird is usually in the listening mode and starts transmitting mode JD PSK signal at 435.910 MHz immediately after receiving

any acceptable AX.25 frame (including a UI frame) through one of four uplink channels, 145.85, 145.87, 145.89 or 145.91 MHz and continues its operation as long as AX.25 frames are received at intervals of less than three minutes. After 3 minutes without receipt of an AX.25 frame the satellite returns to the listening mode.

This "on demand" operation happens while the satellite is in a 2-hour ON period. While the bird is in an ON period, you will hear a 2-3 second PSK burst every minute so you will know that mode JD is available and can be switched on by sending some packets to the satellite. You will hear nothing during the 2-hour OFF period.

This new operation mode will become the base of the coming FO-12 BBS service.

The weekly operation schedule will be determined after enough power usage data for this new mode has been acquired and analyzed.

From JA2PKI and JR1FIG

FO-12 BBS PROGRAM NEARS COMPLETION

The software for the FO-12 on-board BBS program is now running on the JAS-1 engineering model and being tested by the JAMSAT software team. The first version of BBS program, which has a limited number of commands, will be loaded and tested on FO-12 soon.

Please keep in mind that during testing, though you may hear PSK beacons from the FO-12 BBS, it does not mean that the BBS is available for public use. While the software team is testing its functions your attempt to connect to FO-12 may fail, returning a busy response.

The first version of the program will have following commands:

- F List latest 10 message headers with message number.
- F* List all the message headers.
- R <n> Read a message numbered <n>
- W Send a message. You will be asked for the addressee and subject.
- K <n> Kill message number <n>. A message being read by other station(s) cannot be killed. (FO-12 BBS is a multi-user system.)
- H Help. List the available commands. It may list commands which are not currently available, such as M and A.

Your TNC should be set as follows:

Protocol : It must use AX.25 version 2. WASDED
PROMs are needed for TAPR TNC 1.

Command TNC-1 : V2

TNC-2 : Ax2512v2 ON

T1 timer : 6 seconds or longer.

Command TNC-1 : F6

TNC-2 : FRack 6

Maximum frames : 2 or 3 is suggested.

Command TNC-1 : O2 or O3

TNC-2 : MAX 2 or MAX 3

Notes:

The call sign of FO-12 to which you connect is 8J1JAS.

There will be no command to log off. Simply disconnect by using your TNC's disconnect command.

Personal mail will not be supported by this first version. Your messages can be read by anyone and you can read messages addressed to someone else.

While the BBS is in operation, digital repeater mode is disabled.

Digipeated packets will not be accepted by FO-12.

An increase in the number of users will slow the BBS response and require a longer T1 time.

The maximum acceptable length of the data portion of a packet (PACLEN) is 199. A shorter length is desirable.

FO-12 transmits at PACLEN=128 and MAXFRAMES=1.

This information is preliminary and may be changed without notice.

From JA2PKI and JR1FIG

NTS RIDES THE WAVES!

Brian, N1BBT/MM, is in charge of communications (and a myriad of other things) for the Massachusetts Marine Academy's training vessel Patriot State. They are presently in dry dock in Virginia for repairs. Whether or not they set sail this summer is open to debate, but when they do they'll likely head for the Mediterranean. On board, they typically have 600-700 love- and family-starved Cadets and crew who rely heavily on Amateur Radio.

A few years back, N1BBT, KW1U, WA1TBY and others met with K1OJH and several other key New England Packet Radio Association (NEPRA) people in the hopes of using their newfangled packet equipment to handle the several thousand pieces of formal message traffic that are generated during a cruise. Due to the lack of packet equipment and people knowledgeable about packet traffic procedures and a host of other reasons, packet fell through and we had to rely on CW.

That was all well and good, but now with the excellent extensive packet network on 20 meters and with N1BBT's on-board packet gear, we're ready to let autoforwarding do it's thing. WA1WLV's BBS will be made available to accept traffic from Brian. Use of NTS designators such as NTSEM, NTSME etc seems to be working well, so that method will be used.

By Luck Hurder, KY1T, in the NEPRA PacketEar

NOVICE PACKET ACTIVITY

We at Gateway would be interested in hearing from the packet community what Novice packet activity is occurring. How many Novices are using packet in your area? What frequencies are being used on 10 meters and 220 MHz? Are there digipeaters and/or BBSs available in the 220 MHz Novice band? How about gateways, either BBS or digipeater, between 220-MHz Novice frequencies and the local 2-meter networks? Anything happening on 1.2 GHz? Please respond to:

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225 Main Street
Newington, CT 06111

MFJ-1270B HINTS & KINKS

I recently installed Software 2000's NET/ROM firmware in an MFJ-1270B. Several minor modifications to the TNC are recommended by Software 2000, and in the course of making these modifications I came across a couple of problems. So that others can avoid the troubleshooting I had to do, I'll present the information here.

One of the changes needed is to change the CPU clock speed from 2.46 MHz to 4.92 MHz. According to the MFJ manual, this can be done by moving the JMP2 jumper. JMP2 is a three-hole jumper, with the three holes in a line. The manual says that the fast clock can be obtained by moving the jumper from the RIGHT position (shorting the center and rightmost pins) to the LEFT. (You have to cut a PCB trace that normally makes the RIGHT connection.) Unfortunately, this isn't true! To get the fast clock, what you really need to do is connect the leftmost and rightmost pins, leaving the center one unconnected. Apparently, the board layout in this area changed slightly between the MFJ-1270 and MFJ-1270B, but the manual wasn't updated.

NET/ROM also specified use of 9600 bauds on the serial port. When I set the switches to use 9600, operation of the TNC became intermittent. Sometimes the serial port would operate perfectly, other times it wouldn't work at all. Wiggling the DB-25 serial port connector or the DIP switch at the rear of the TNC would activate the intermittent. After investigation, I found that the circuit-board trace that carries the 9600-baud clock signal runs directly under the DB-25 connector, which has a metal housing and is bolted to the circuit board. Apparently, the clock line was shorting to the grounded housing of the DB-25 connector. To fix this, I removed the bolts from the connector, gently lifted it and slipped a piece of thin cardboard between the connector and the circuit board. After I replaced the bolts and reassembled the TNC, the intermittent was gone.

Neither of these problems showed up on an original MFJ-1270 to which I made the same changes. (The '1270 uses a DB-25 connector with a plastic housing.)

By KE3Z

TIDBITS FROM CAPRA

The Chicago Area Packet Radio Association (CAPRA) will ask the Northern Illinois Packet Frequency Council to coordinate additional frequencies for 1200-bit/s operation in the 220-MHz Novice band. Present allocations on 220 MHz are not in the Novice part of the band. Additional requests will be made for 1200- and 9600-bit/s frequencies in the 440 MHz band and for 56-kbit/s frequencies in the 902 MHz band.

In it's comments to the FCC regarding General Docket 87-14, the proposed reallocation of 220-222 MHz, CAPRA detailed the technical problems it has experienced operating an experimental 9600-bit/s link in downtown Chicago. The front end of the receiver had to have added filtering to reject signals from a channel 11 TV transmitter, and transmitter power had to be increased to overcome interfering signals from the radiated local oscillators of nearby television receivers tuned to channel 7. These effects would undoubtedly cause problems in the proposed land mobile use of this frequency range as well.

From Steve Goode, K9NG

MODEMS NEEDED FOR HF

One of the issues to be addressed in the near future is increasing the speed limit for HF packet. The League is planning to file a request with the FCC for special temporary authority (STA) that will allow 1200-baud testing. The critical element of such a speed increase is identifying or developing modems for use at 1200-bauds. Current Bell 202 modems, such as are used at VHF, are not well suited to the HF environment. Current 1200-baud modems, as used on VHF, are not very bandwidth efficient. They use a frequency shift of 1 kHz, which is far more than is needed, and do not make any special effort to reduce the distant (from the center frequency) sidebands; the SSB transmitter's crystal filter acts as a last line of defense to limit the transmitted bandwidth. On the crowded HF bands, a narrow occupied bandwidth is important, and the high noise levels dictate that receiver bandwidth be made as narrow as is practical. The relatively low signal-to-noise ratios found on HF also impact the modem design, as does the presence of multipath distortion. These considerations make selection of the "best" modem standard problematic, but one advantage of higher speeds is the shortened transmission time compared to the period of the fading cycle.

ARRL has been in contact with some of the possible manufacturers of such devices, suggesting that now is the time to develop the techniques. Some of the possible approaches to higher speed modems include:

- o 1000-Hz shift FSK (Bell 202), as is used on VHF now.
- o 800-Hz shift FSK (CCITT V.23), which is available in the AM7910/AM7911 modem chip.
- o 600-Hz shift FSK (MSK).
- o Standard PSK techniques, including Bell 212A and CCITT V.22 standards.
- o FO-12 PSK modems.
- o V.26ter (1200 and 2400 bit/s PSK), as used in the Kantronics KPC-2400.

In the ARRL lab, work is under way evaluating 1200-baud MSK modem chips made by MX-COM, Inc. We intend to measure the performance of these modems versus Bell 202 and V.23 using the AM7910 chips. Other approaches need to be tested as well, and we would like to hear from anyone who is working in this area.

By KE3Z

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